

REMARKS

Claims 1-23 were pending in this application. Claim 23 has been withdrawn from consideration pursuant to the provisions of 37 C.F.R. § 1.142(b). By way of this amendment, claims 1, 3, 6, and 10 have been amended and claims 2 and 9 have been canceled. Moreover, the specification has been amended at pages 1 and 2 to update the related application information. Care has been exercised to avoid the introduction of new matter. Indeed, adequate descriptive support for the present Amendment should be apparent throughout the originally filed disclosure and claims. Applicants submit that the present Amendment does not generate any new matter issue.

Claims 1-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the admitted prior art (APA) in view of Shvartsman (U.S. Pat. No. 5,279,689) and further in view of Greschner et al. (U.S. Pat. No. 5,427,599, hereinafter "Greschner") and D'Amato et al. ((U.S. Pat. No. 4,900,111, hereinafter "D'Amato"). Applicants respectfully traverse the rejection.

Independent claim 1, as amended, describes a method of performing imprint lithography of a surface of a workpiece including a substrate and a layer of an imprintable resist material. A stamper/imprinter comprised of a material having thermal expansion characteristics different from the material of the substrate is utilized for embossing a desired pattern in the workpiece surface. The method comprises conducting the embossing at room temperature, whereby deleterious effects arising from differences in thermal expansion/contraction characteristics of the stamper/imprinter and workpiece are avoided. The stamper/imprinter comprises a support body; and an imprinting surface having a negative image of a servo pattern for a recording medium formed therein.

Independent claim 17 describes a method of forming a servo pattern in the surface of a substrate for a magnetic recording medium. the method comprises the steps of: (a) providing a workpiece including a substrate for a hard disk magnetic recording medium and a layer of an imprintable resist material overlying the substrate and having an exposed upper surface; (b) providing a stamper/imprinter including an imprinting surface having a negative image of the servo pattern formed therein; and (c) utilizing the stamper/imprinter for performing room temperature embossing of the exposed upper surface of the layer of resist material with the negative image of the servo pattern.

The Examiner relied on Applicants alleged admissions at pages 2-4 and Figs. 1A-1D of the present specification and stated that the “basic claimed method is taught in the prior art lacking essentially the aspect of embossing at room temperature ‘whereby deleterious effects... are avoid.’” The Examiner relied on the additional teachings of Shvartsman and asserted that this reference discloses embossing a hologram onto a plastic resist-like film without any heating. The Examiner concluded by asserting that is well known in the art that thermal mismatch between a stamper and substrate can cause stresses when the materials cool down together from a high temperature embossing process and, therefore, one of ordinary skill in the art would have been motivated to replace the heated embossing of the known prior art with a room temperature embossing to prevent these stresses, as taught by Shvartsman. The Examiner turned to Greschner in an attempt to demonstrate that it is know in the art to match the thermal expansion coefficients of a stamp and a substrate material which are cooled down together upon a high temperature embossing, otherwise any mismatch would cause stress or breakage of the embossed substrate. The Examiner relied on D’Amato to demonstrate that embossing holograms into metal at room temperature and, therefore, one of ordinary skill in the art knows that room temperature embossing

is possible as long as the substrate is softer than the stamper. Applicants respectfully traverse the rejection.

As discussed at page 6 lines 3-22 of the instant specification, there exists a need in the art for improved methodology and means for performing imprint lithography which eliminate, or at least substantially reduce, the disadvantageous degradation of imprint quality associated with the use of imprinting tools and resist materials having different thermal expansion/contraction characteristics in thermal imprint processing. More specifically, there exists a need for an improved means and methodology for imprinting or embossing a pattern, e.g., a **servo pattern**, in a surface of a resist or other type relatively soft layer on the surface of a high modulus substrate for a data/information storage and retrieval medium, e.g., a hard disk magnetic recording medium, which substrate is comprised of a glass, ceramic, glass-ceramic composite, or metal-based material. Thus, the Examiner's simplification/characterization (page 3 of the Office action) of the present claimed methodology is improper. Contrary to the Examiner's assertion, the disclosure at pages 2-4 and Figures 1A-1D does provide any motivation which would have realistically impelled one having ordinary skill in the relevant art to modify the methodology of the prior art to arrive at the claimed invention.

The present invention addresses and solves problems and difficulties such as degradation of replication quality due to resist deformation, peeling, and poor mold release, attendant upon the use of thermal imprint lithography for pattern definition in substrate/workpiece surfaces, such as in the fabrication of hard disk substrates with integrally formed **servo patterns**, while maintaining full capability with all aspects of conventional automated manufacturing technology for pattern formation by imprint lithography.

The present invention addresses and solves problems attendant upon the use of stampers/imprinters and workpieces of different materials, hence different thermal expansion/contraction characteristics, when performing imprint lithography at elevated temperatures, e.g., nanoimprint lithography for forming submicron-dimensioned patterns and features in substrate surfaces utilized in various technologies such as semiconductor IC processing and magnetic recording media manufacture, and is based upon the discovery that degradation of pattern replication fidelity arising from resist damage, loss of dimensional accuracy, peeling, sticking, etc., can be eliminated, or at least minimized, so as to facilitate accurate, high quality replication of a desired feature or pattern in an imprintable layer, e.g., of a resist material, on a workpiece surface. See specification at page 10, line 23 through page 11, line 12.

A significant aspect of the present invention comprises imprinting the pattern in a resist layer overlying a substrate of a workpiece at room temperature, i.e., without thermal input, by means of a device such that the surface of the resist layer accurately conforms to the surface topography of the stamper/imprinter. As a consequence of the elimination of the thermal cycling between lower, higher, and lower temperatures associated with conventional thermal lithographic imprinting, the inventive methodology avoids, or at least minimizes, the above-described deleterious effects on replication fidelity associated with the differences in thermal expansion/contraction characteristics of the stamper/imprinter and the workpiece arising from the different materials utilized for the former and the latter. See page 11, lines 12-18.

Applicants submit that the concept of eliminating thermal cycling between lower, higher, and lower temperatures to avoid, or at least minimizes, the above-described deleterious effects on replication fidelity associated with the differences in thermal expansion/contraction characteristics of the

stamper/imprinter and the workpiece is alien to the applied prior art. In establishing the requisite motivation, the Court of Appeals for the Federal Circuit has repeatedly held that the Examiner must make "clear and particular" factual findings as to a specific understanding or specific technological principle which would have realistically impelled one having ordinary skill in the art to modify a particular prior art reference to arrive at the claimed invention based upon facts, not generalizations. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 57 USPQ2d 1161 (Fed. Cir. 2000). Significantly, the requisite motivation must be undertaken from the viewpoint of one having ordinary skill in the art confronted with the same problem confronted by the Applicant. *Ecolochem Inc. v. Southern California Edison, Co.* 227 F.3d 1361, 56 USPQ2d 1065, 1076 (Fed. Cir. 2000); *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998). Moreover, the problem addressed and solved by a claimed invention must be given consideration in resolving the ultimate legal conclusion of obviousness under 35 U.S.C. §103. *North American Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 28 USPQ2d 1333 (Fed. Cir. 1993); *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 15 USPQ2d 1321 (Fed. Cir. 1990); *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989); *In re Nomiya*, 509 F.2d 566, 184 USPQ 607 (CCPA 1975).

In this respect, it is significant to note that neither the APA, Shvartsman Greschner, nor D'Amato identifies or solves the problem addressed and solved by the present invention. Moreover, and significantly, Applicants solution stems from the recognition of the source of the problem, namely that degradation of pattern replication fidelity arising from resist damage, loss of dimensional accuracy, peeling, sticking, etc., all stem from the differences in thermal expansion/characteristics of the stamper/imprinter and the workpiece arising from the different materials utilized. The discovery of the source of a problem, itself, constitutes an indicium of

nonobviousness which merits consideration. *In re Spinnoble*, 405 F.2d 578, 160 USPQ 237 (CCPA 1969).

Applicants stress that Shvartsman and D'Amato relate to embossed holographics and do not recognize the problems associated with the formation of servo patterns in the surfaces of substrates utilized in the manufacture of data/information storage and retrieval media, such as hard disk magnetic media. The Examiner has failed to factually establish any relevant similarities between making embossed holograms vis-à-vis imprint lithography for forming submicron-dimensioned servo patterns. Applicants respectfully submit that Shvartsman and D'Amato are non-analogous prior art that cannot be applied against the claimed invention. Neither reference is within the same field of endeavor nor reasonably pertinent to the particular problem with which the inventors are involved. *In re Clay*, 23 USPQ2d 1058 (Fed Cir. 1992). Thus, there is no motivation which would have realistically impelled one having ordinary skill in the relevant art to modify these prior art reference to arrive at the claimed invention. *Ruiz v. A.B. Chance Co., supra*.

Greschner relates to embossing of servo patterns by a hot stamp process. The reference teaches away from the performing room temperature embossing, as required by the present claims. This teaching away from room temperature embossing constitutes evidence of nonobviousness. *In re Bell*, 991 F.2d 781, 26 USPQ2d 1529 (Fed. Cir. 1993), *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 6 USPQ2d 1601 (Fed. Cir. 1988), *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986), *In re Marshall*, 578 F.2d 301, 198 USPQ 344 (CCPA 1978). Absent the present disclosure as a template, one of ordinary skill in the art would not have modified Greschner's teachings to arrive at the claimed invention. The only motivation is Applicants' own disclosure. Applicants' disclosure, however, is forbidden territory for the

Examiner to obtain the requisite motivation for combining the applied prior art. *Panduit Corp. v. Dennison Mfg. Co.*, 774 F.2d 1082, 227 USPQ 337 (Fed. Cir. 1985).

It is believed that all pending claims are now in condition for allowance. Applicants therefore respectfully request an early and favorable reconsideration and allowance of this application. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicants' representative at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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Date: December 17, 2003